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SEISMOLOGIST TELLS OWN EARTHQUAKE EXPERIENCE

By Dr. Bailey Willis,
President of the Seismological Society of America, and Professor Emeritus of Geology, Leland Stanford University.

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(Prof. Willis at the time of the earthquake was staying in the suburbs of Santa Barbara where he was engaged in geological research. This is therefore a first-person story by the man who is rated as America's foremost seismologist.)

The Santa Barbara earthquake was a movement on a fault that runs along the Santa Ynez range of mountains and passes through the Sheffield reservoir which held the city's reserve water supply. The general direction of the movement of the earth along this fault was apparently south to north, as shown by the scar made by the trail of the cannon mounted on the platform near the post office building. This showed that it moved sixteen inches south. The chimneys which were demolished on many houses otherwise uninjured were thrown in all directions according to the mechanical conditions surrounding them. In some cases they remained standing although twisted as much as thirty degrees at the line of fracture.

An inspection of the damage in Santa Barbara shows that the lessons of the San Francisco and Tokyo earthquakes could be applied here. I drove through the city within an hour after the shock and noted the buildings of various kinds -- wood frame, brick, reinforced concrete, etc. Those that remained undamaged were well constructed. Badly designed reinforced concrete, failed, as shown by the disastrous collapse of the San Marcos office building, an edifice of four stories in which one corner gave way. Brick veneers which were not tied to the frame fell out, as in the case of the California hotel, where the floors remain standing, although stripped of walls on three sides. In general good design and honest workmanship stood, while incompetency and bad workmanship were exposed in all their miserable nakedness.

The earthquake was not unexpected among seismologists. During the last seven years we have had the San Jacinto, Inglewood, Elinore and San Bernardino shocks, each one resulting from movement on one of the four great earthquake faults of southern California. The system of faults which outlines the San Gabriel range extends west through the Santa Paula valley and skirts the Santa

Ynez range had not up to this time shown any evidence of disturbance. It was well known, nevertheless, that a strong pressure exerted against the mountain range from the south has caused it to move gradually, so that Gaviota Peak, a triangulation point of the U.S. Coast and Geodetic Survey, has been pushed northward twenty-four feet in thirty years. As the last great earthquake shock in this region occurred sixty-eight years ago, in 1857, those who are familiar with the history of earthquakes in California expected a disturbance.

To a certain extent their expectations are now fulfilled, but fortunately the Santa Barbara earthquake is much less severe and much less general in effect than some seismologists have feared it might be. There is now little reason to anticipate any severe shock in the immediate future. We shall experience the usual crop of after tremors, but they will gradually die away as the rocks return to their normal condition of elastic strain.

The expectations of seismologists in regard to the coming of the Santa Barbara shock were of general nature only because we have not yet established the recording stations, which if set up throughout the coast region of California would enable us to foresee such occurrences. The Carnegie Institution of Washington is now engaged in establishing stations at Pasadena, Riverside, La Jolla and other points in southern California, where instruments designed to record local earth tremors will be set up.

All of the stations will operate in unison under the central control of the principal station at Pasadena and the records which they will yield will enable us to fix the focus of even the slightest tremors within fifty or sixty miles of the stations. As the records are continuous we shall know exactly where the earthquake strain is gathering and how it increases or diminishes from day to day or month to month.

In the course of time a chain of stations of this character will no doubt be established from San Diego to the Oregon line. But it will have to be done through the cooperation of the communities interested and will not be accomplished until public opinion is educated to an understanding of the advantage of knowing all that we can about earthquakes and the methods of protecting ourselves against their effects.

EARTHQUAKE A TEST OF BUILDINGS WORTH

by Watson Davis,
Managing Editor, Science Service.

Again Mother Nature has had growing pains and again it is demonstrated that man does not learn by experience.

For while the delightful Pacific coast town of Santa Barbara was left is in ruins, without water, gas or electricity, and the whole length of its principal State Street is practically wrecked, there are some buildings that are essentially undamaged. Those buildings that came through their serious shaking nearly unscathed were those that were built well.

The lesson that can be learned from the disaster here which I have just witnessed is that in areas subject to earthquakes, engineer, architect, contractor and owner must insist that the structures that they erect must be as nearly

earthquake-proof as modern engineering can make them.

This is a lesson that should have been learned from the disasters at San Francisco and Tokyo. Unfortunately, it will probably require many more earthquakes, many of them of much greater severity than this one, to cause men to refrain from erecting death traps over their very heads. For earthquakes will continue to occur in California as well as in other parts of the surface of the globe.

Near the railroad station at 6:44 A.M. there was a handsome hotel recently erected at a cost of some $200,000. At 7:04 its guests found themselves exposed to public view on three sides of the structure. The shock had simply sliced the brick walls from the frame of the building. Such instances may be multiplied many times.

Yet Prof. Bailey Willis, president of the Seismological Society of America, who was in Santa Barbara and experienced the quake, says that it was a moderately severe, but not a very severe, shock, and that it is not a shock in which any decently built house should come down.

That the shaking was comparatively slight I can personally attest, for I had the great privilege of going through this earthquake totally unconscious of what was happening. I was asleep. I was on the last overnight Southern Pacific train to pass through Santa Barbara before the shock. At the instant of the first shock this train had reached three miles south of Santa Barbara, where it was nearly derailed by the force of the earthquake. The engineer stopped until the six severe shakes within nineteen minutes had passed away, and then proceeded cautiously toward Los Angeles. I supposed that the motion was due to normal train operations and slept through it all. The reports of the other passengers caused me to hurry back to Santa Barbara on the first Red Cross relief train leaving Los Angeles.

In spite of the coincidence of the two earthquakes, seismologists declare that there is no relation between the Montana shocks of Saturday and Sunday, and those at Santa Barbara. Both of these disturbances will, however, be the subject of detailed investigation by competent scientists.

EARTHQUAKES LIKE SAFETY VALVES SAYS SCIENTIST

Eight to ten thousand earthquakes are recorded every year in various parts of the world, and probably four times as many as this occur, but far from being alarming this is a very reassuring fact, Dr. William Bowie, of the U.S. Coast and Geodetic Survey says. This is because the earth is thus shown to be a body capable of yielding to stresses and strains. If it were not the case, the strain would accumulate until great enough to produce disruptions far more violent than any that have ever occurred, and perhaps sufficient to wipe out all the works of man.

While the earthquake in California followed so closely upon the heels of the one in Montana, this is only a coincidence, said Dr. Bowie, and there was no direct connection between them, except that the shock of the Montana quake might have been the trigger to set off the one in California. This could not have occurred, however, unless the conditions had been ready for a tremor, and any one of a number of things might have been the last straw. Dr. Bowie thinks it possible that the rising of the tide might do it, as a depth of water of

only eight feet, when extended over an area of hundreds of square miles, would exert a pressure of millions of tons.

The real cause of earthquakes, he said, is erosion, by which rains carry soil from mountains to valleys, and sedimentation, by which rivers and streams carry material to their mouths and deposit it there. These work gradually, but in time the amount of material moved is enormous, and the distribution of weight on the earth's surface is greatly altered. Because of the earth's ability to yield, the crust gives, and a fault, or crack, develops, along which future quakes may occur. A recognized fault passed through Santa Barbara, and is shown on a map issued by the Seismological Society of America showing the California faults. The Santa Barbara fault was supposed to be dead, however, as no tremor had occurred along it within historic times. The famous San Andreas fault, which caused the San Francisco earthquake in 1906, extends for many hundreds of miles, but does not pass near Santa Barbara.

In spite of the great damage done by the California shake, it was not nearly as violent as the one in Montana, said Commander N.H. Heck, in charge of the Coast and Geodetic Survey's seismological investigations. This was indicated by the seismograph records obtained by the Survey's stations at Cheltenham, Md., and Tucson, Ariz., as the records of the Montana quake were much more distinct, and was borne out by the reports of the area affected. In California, only about four counties felt the tremors, while three states besides Montana were shaken.

CIVILIZATION'S ADVANCE WIPES OUT MANY WORLD'S SMALLEST CREATURES

The struggle of man with nature and civilization's consequent advance is wiping out many small and microscopic plants and animals just as it has meant death to the buffalo, the carrier pigeon, the fringed gentian, the moccasin flower, and dozens of other animals and plants.

As the result of a survey, Dr. Henry B.Ward of the University of Illinois has found that the destructive activities of man affect the minute organisms which form the fundamental food supply of larger forms.

"In connection with the extensive and in part unavoidable destruction of breeding and feeding grounds to provide for the improvement of the land and the maintenance of a larger population", said Dr. Ward, "is added a little appreciated but exceedingly pernicious influence. Aquatic organisms of all sorts are affected by the extensive pollution of streams and lakes by city sewage and manufacturing wastes. Once that the public is educated to a comprehension of these unnecessary losses, it will insist upon the proper care of such wastes at the source.

"The irrepressible conflict of a growing civilization with a rich fauna shows many changes that were unavoidable and includes also much wanton destruction of valuable natural resources.

"The early records of pioneers and explorers portray vividly the marvelous richness of the North American fauna. Multitudes of wild mammals on the land, birds in the air, and fish in the water furnished a varied food supply for settlers that did not disappear in many regions until fifty years ago. The total extermination of some species and the impending destruction of many other forces consideration of the proper methods for the conservation of our biological resources.

"The magnitude of the interests involved is demonstrated by the present day value. The game is almost gone. The fisheries, already greatly depleted in many regions, are threatened with early destruction in the absence of better control. Legal measures to limit the destruction of wild animals deserve more careful consideration and more strenuous enforcement. Such measures should be based upon adequate knowledge of the life history and breeding conditions favorable to the species. Maintenance of government hatcheries constitutes a partially effective correction for the heavy tax laid upon native fishes by commercial fisheries.

"Our national parks serve the purpose of preserving in native purity unique examples of the American wilderness. As national museums, they will exhibit to posterity native wild animals under primitive conditions. Their preservation from the encroachments of commercialism is a debt we owe to future generations, and deserves the unqualified support of all true Americans."

MICROBE HASH TO CURE EXTERNAL TUBERCULOSIS

An electrified mixture of pulverized microbes and iron filings for the cure of exterior tuberculosis, such as lupus, tuberculosis adenitis and the like, has been presented to the Paris Academy of Sciences, by Professor Charles Richet. The process is the invention of Dr. Arthur Grimberg, and has been tested on over 250 patients already. It consists essentially of a colloidal extract of the Koch bacillus, injected under the skin of the sufferer.

The microbes are the base of the preparation. The iron filings are used in breaking them up. By placing a culture of these bacilli in a tube together with iron filings, and subjecting them to a variable electro-magnetic current, they are broken up into a very fine powder-like condition, and brought into solution in the form of a colloidal mixture which will circulate in the blood vessels of a human being and react on the infected parts.

Dr. Grimberg and his assistants report results as being unusually encouraging. The normal treatment is two subcutaneous injections daily. From the number of patients treated, 54 per cent. of complete cures have been registered; 26 per cent. of ameliorated cases; and 20 per cent. of at least temporary checks of the progress of the disease. The latter group, it is said, all gave up the treatments for one reason or another before any permanent result could have been had. The greatest number of cures was had on the soft-lesion type of malady, such as glandular tuberculosis.

Many of these patients on whom the tests were made had been operated on one or more times without success, or had made long trips for cures. They all reacted promptly to this treatment, and the average case required only from 15 to 20 injections for a cure.

The treatment is being studied by the leading physicians of Paris, and in fact many of the tests were made in the clinics of the big hospitals. A large number of successful cures were presented in the Société de Chirurgie by some of the leading members, who had made the tests personally in their clinics.

PACIFIC OCEAN SHOULD YIELD BILLION ANNUALLY

A billion dollars annually. That is the wealth that the Pacific Ocean should yield to man provided man takes the trouble to properly conserve and regulate the utilization of the natural resources of the Sea. According to Dr. Barton Warren Evermann, director of the museum of the California Academy of Sciences, the only way in which this income fromthe sea can be obtained is through the restoration of the fur-seal herds of the south Pacific and Antarctic. And this is to be accomplished by an international agreement among the maritime nations of the world.

"The aquatic natural resources of the Pacific are many and enormously valuable," Dr. Evermann explained. "They consist of the marine mammals of which there are between forty and fifty species, including fur-seals, whales, and sea otters; the food fishes, such as salmon, cod, herring, halibut and tuna; the invertebrates, such as oysters, clams, possessing great possibilities, and a great multitude of miscellaneous animals and plants, as sea turtles.

"The aggregate annual product of these various resources can easily be made to reach fully one billion dollars, when proper fishery methods and conservation measures are enforced. The fisheries for many of these resources are carried on outside of the three mile limit where there can be no restriction except through international agreement. The result has been that many of these resources, such as fur seals, sea otters, whales, and others have in many places been already reduced to commercial extinction.

"In the north Pacific are three species of fur seal, -- one belonging to Japan, one to Russia, and one to the United States. The Alaska or American herd is the most important. When the United States came into possession of this herd in 1867, there were probably 3,000,000 seals in it. Our government gave to the Alaska Commercial Company the exclusive right to kill the seals. The fur seal is highly polygamous; one male to every 40 or 50 females is all that is necessary for breeding purposes. As the young are equally divided between the sexes it is evident that for every forty males born thirty-nine are not needed for breeding purposes and can therefore be killed for their skins.

Under the lease of the Alaska Commercial Company they were able to kill about 100,000 of these surplus males every year without diminishing the size of the herd. So long as this selective killing was done the herd remained normal in size.

"But in the early eighties certain people from Victoria and elsewhere discovered that they could go out in boats, intercept the seals in their return migration, and kill enough to make the business very profitable. They could not select the males for killing; the majority of those they killed were females and that meant the killing of the breeding stock. As a result, the herd decreased rapidly so that by 1912 there were only about 127,000 left. The herd had almost reached commercial extinction.

"Subjects of Great Britain and Japan were the ones chiefly engaged in killing seals on the high seas, and the United States appealed to those countries to enter into a treaty with the United States by which pelagic sealing would be unlawful. To induce those countries to do that, the United States offered them each fifteen per cent. of all the seals we would kill on our islands. They

accepted the offer, signed the treaty, and pelagic sealing stopped in 1912. Since then the herd has increased from 127,000 in 1912 to over 700,000 in 1924, and the government is now able to kill 25,000 to 40,000 surplus young males every year worth from one to two million dollars annually. This shows how rapidly a once dwindling resource can be restored under proper international agreement.

"In the southern Pacific and the Antarctic are remnants of more than a score of fur-seal herds which have long been commercially extinct, but which can be restored to vast commercial importance as has the Alaska fur-seal herd."

WOMAN BOTANIST CLIMBS HIGH BRAZILIAN PEAKS

Penetrating a desert to see a waterfall as great as Niagara, climbing the highest peaks in eastern Brazil, botanizing over ground where no collector has been since the time of Napoleon, were features of the scientific explorations of Mrs. Agnes Chase, botanist of the U.S. National Herbarium, just returned from seven months in the wilds of the South American republic.

"Many people have the idea that Brazil is a country of unbroken jungle," said Mrs. Chase. "As a matter of fact, most of the eastern plateau that makes up the great eastern 'shoulder' of South America on the map is too high and dry for forests, and is either grassland or what we would call in this country 'high scrub' or chaparral. Since I was looking especially for species of grasses, it was into this region that I went.

"I went first into the upland country back of Pernambuco. This is a poor, barren land, semi-desert, and rapidly being turned into complete desert by heavy over-grazing. There is no transportation here except on donkey-back, and the large numbers of animals required to do a little work are simply eating the country bare. It was in this region that I saw the great Paulo Alfonso falls, a cataract as great as Niagara, in the midst of a barren desert. Near these falls I picked up some shells, which I am told are a new species of snail.

"Then I went southward, into the more temperate province of Minas Geraes. This is a more fertile, better settled region, with rolling hills like Nebraska; only the grass is long and high instead of short as on our prairies. It was down in this southern country also that I did my mountain climbing. I ascended the two highest peaks in Brazil east of the Andes, both of them nearly ten thousand feet in elevation. One of them was pretty easy, but the other was a really difficult climb.

"In this richer region, collecting of course was much better. I got the larger number of specimens here. My entire collection amounts to something like 2,000 specimens, including some 500 grasses. We haven't examined them all yet, but there will probably be several new species; and there are many that I found growing abundantly that were known before from only a single specimen."

The North Pole does not remain in the same place, but may move as much as 60 feet in a few months. It usually remains, however, within a square 60 feet on a side.

CELESTIAL OBJECT MAY BE A COMET

What may be the Tempel-Swift comet has been sighted by M. Delporte, a European astronomer, according to a dispatch received from Copenhagen, it was announced by Dr. Harlow Shapley, director of the Harvard College Observatory.

The new visitor is described as an object of the tenth magnitude, so that it is too faint to be seen without the aid of a telescope, and is located in the constellation of Pisces, the Fishes. It will be necessary to arise early to see it, however, as this constellation does not rise above the eastern horizon until about 3.00 A.M.

The Tempel-Swift comet has a period of about five and one half years. As it was expected back this year, and, according to the calculations of its orbit, should be in approximately the position of the new object, Dr. Shapley thinks it possible that it is the comet.

MELONS FEWER; PRICES HIGHER

Only five watermelons will grow this year where six grew before, according to the estimates of the U.S. Department of Agriculture. The market will not be glutted as it was last year, and all melons will taste better because they will cost more. Preliminary estimates show that 125,660 acres of land will be planted in watermelon by the time the season is over. Although this is the smallest acreage in many years no real shortage is expected.

FISH POISONING PLANTS PROVE DEADLY TO INSECTS

That the age old custom of intoxicating or poisoning fish so that they may be easily caught, as practiced in Madagascar, India, Ceylon, the Ivory Coast, Central and South America, and other tropical parts of the world, may be the forerunner of a very beneficial discovery for the same peoples, is the prediction of Monsieur Auguste Chevallier, in presenting his recent findings on the subject to the Academy of Sciences in Paris.

For many centuries the natives of these lands have been in the habit of using certain plants for capturing fish. The method of using these narcotic growths to catch fish is by taking the leaves and bruising them in a mortar. Thus crushed, they are put in sacks, which are thrown in the ponds where fish are known to exist. Several natives go out and stir up the water around this "belt" of narcotic material, while the others chase the fish toward the poisoned area.

As the fish pass through the poisoned zone, they become intoxicated or are killed, and float to the surface, where it becomes only necessary to gather them in. So far as has been discovered, this poisoning does not make the fish harmful in any manner to the natives.

As these plants drop out of use one way, they seem to be turning toward another and even more beneficial service to mankind. A chemical called "tephrosine" has been isolated from the tephrose group of plants by M. Hanriot

a chemist. A small dose of this compound kills instantly the fish that come in contact with it. Lately three English investigators, Tattersfield, Ginningham, and Morris, have showed that this drug can also be used to kill harmful insects. And here the plants of this group, which are still under cultivations, may play an important part in the warfare of man against insect.

PROMISES UPSET IN HEREDITY THEORY

Modern theories of heredity may be refuted by experiments now being made at Stanford University by Professor L.L. Burlingame of the Department of Biology on a plant known as the Clarkia. On first investigation this plant appeared to be contrary to the accepted laws of heredity; however, experiments are being continued to prove that that is merely an explainable deviation.

The present theory is that in every plant or animal there is a definite number of units, known as chromosomes. These units work in pairs. Man has 48 of these pairs. These chromosomes furnish the means for transmission of hereditary characteristics.

The Clarkia appears to have a varying number of pairs. The correct number seems to be four, but there have been counted from five to eight pairs in the sex cells and from two to seven in the body cells. This is in defiance of all knowledge of heredity.

Professor Burlingame discovered this wide variation while experimenting in hybridization of this plant in the garden. Upon noticing the inconsistency of the plant, he began a thorough study of its properties. He is attempting to prove that it may be explained by the chromosomes having broken up into smaller particles, but still remaining unchanged in their original quantity. If this were true, the smaller parts would be the same size as the sum of the proper number of full sized chromosomes. Owing to the irregularities in their shapes, however, great difficulty is being found in measuring them.

This is the only known case in which the number of chromosomes varies though there may be others yet undiscovered. Professor Burlingame believes that the explanation will be in accordance with the laws as they are now understood, and is attempting by experiment toconfirm his theory.

DON'T DRINK METHANOL! ITS POISONOUS

Methanol, the synthetic alcohol which is now being made cheaply in Germany, is just as poisonous as the similar wood or methyl alcohol, despite claims that the foreign product, because of its high purity, is harmless. This statement is made by Dr. Reid Hunt, of the Harvard Medical School, in "Industrial and Engineering Chemistry", following a series of experiments.

"The results with the German (synthetic) methanol were the same as those obtained with pure methyl alcohol obtained from wood distillates," says Dr. Hunt. "It can confidently be predicted that the use of the synthetic methanol as a beverage or as an adulterant will be followed by the same disastrous effects to life and vision as have characterized such uses of wood alcohol. Those who are circulating the report that the synthetic methanol is not poisonous are not only stating an untruth but are assuming a grave responsibility, for death or blindne

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will inevitably be the fate of a number of those who may be misled by such statements and attempt to use synthetic methanol as a beverage."

As a result of his experiments on animals, Dr. Hunt finds that small doses of either methanol or ordinary wood alcohol are not as poisonous as the same amount of ethyl, or grain, alcohol; but when the doses are repeated a few times at 24 hour intervals, the methanol has the most harmful effect. This is because the animal develops a tolerance to the ethyl alcohol. Methanol, however, works differently, as it has a cumulative action, a number of small doses having the same effect as a similar amount given at once.

Man, however, is sensitive to both, and, according to Dr. Hunt, a small dose of methyl alcohol is more harmful than a similar dose of ethyl alcohol. "The more highly developed nervous system of man is more seriously affected by methyl alcohol than is that of the lower animals and permanent blindness has often been reported from single, sometimes small, doses of methyl alcohol, whereas such results are unknown in the case of ethyl alcohol."

TABLOID BOOK REVIEW

THE VOLCANIC ACTIVITY AND HOT SPRINGS OF LASSEN PEAK, by Arthur L. Day and E.T. Allen. Washington; The Carnegie Institution of Washington. Publication No. 360. 190 pages. 1925.

This is one of the most successful pieces of scholarship on volcanism and thermal waters that has been produced in this country. It should be of great interest to all geologists and students of geophysics. Outside of these special classes should appeal also to the educated national parks enthusiast, for it contains more complete information about this recently created national park than can be found elsewhere in the compass of a single volume.

THE HEAVENS; by J.H. Fabre, translated by Dr. E.E. Fournier d'Albe, 336 pp Philadelphia, J.B. Lippincott Company, no date.

Jean Henri Fabre was an acknowledged master in the gentle art of putting scientific facts into popular form, and his style has been ably preserved in the translation of this book by Dr. d'Albe. However, it was first published about fifty years ago, and while it was doubtless complete up to that time, it is unfortunate that it should now be republished without adequate revision. An attempt has been made to indicate some of the later discoveries by an occasional footnote inserted by the translator. This method is at best a makeshift, and when we see such a note as that on page 310, where the author refers to alpha Centauri, the nearest star to the earth, 4.3. light years distant, and the translator states that "A smaller star, called Proxima Centauri, has recently been discovered at about half that distance", we are compelled to question the accuracy of all his notes. Actually, of course, Proxima Centauri is but a fraction of a light year nearer than alpha, the two forming a binary system. Many of the illustrations are poorly reproduced, and it is difficult to understand why a plate such as that facing page 334, showing old drawings of comets and nebulae, should be used as representing these objects when so many modern photographs, taken at the greatest observatories, are so easily available.